BTeV Electronics Projects

Project Assignments
&
Definition Of, Reasons For & Issues In
Requirements & Preliminary Specifications Documents

Electronic Projects Assignments To Date

**This information will soon be accessible
on the BTeV internal web pages
via the "Electronics Projects & Workshops" pointer**

Pixel Detector
Electronics Project Assignments

Project	Primary (Engineering) Responsibility	Level 2 Contact Person (Level 3 Contact Person)
Pixel Detector	Fermilab	Simon Kwan
➢**Front-End Electronics**		
➢FPIX ICs	Fermilab (PPD/ESG)	
➢MCMs & readout	Fermilab (CD/ESE)	(Sergio Zimmermann)
➢**Support Electronics**		
➢High & low-voltage power supplies, & their control & monitoring		
➢Precision movement controls & monitoring		
➢Cooling (incl. elec. protection) & ES&H		
➢(Laser) alignment		
➢Vacuum controls & monitoring		
➢Radiation (levels) monitoring		
➢Detector temperature monitoring		
➢Etc.		

Project	Primary (Engineering) Responsibility	Level 2 Contact Person (Level 3 Contact Person)
RICH Detector	Syracuse	Sheldon Stone
➢**Front-End Electronics**		
➢Analog ICs	Syracuse	(Marina Artuso)
➢Front-End Boards & readout to DCBs	Syracuse	(Marina Artuso)
➢**Support Electronics**		
➢High & low-volt. pwr spys; ctrl & monitoring		
➢Gas controls & gas radiator monitoring		
➢Aerogel monitoring		
➢Photon detector pulsing system		
➢Electronics calibration		
➢Mirror alignment		
➢HPD bias voltage controls & monitoring		
➢Cooling (incl. elec. protection) & ES&H		
➢Etc.		

EM Calorimeter Detector
Electronics Project Assignments

Project	Primary (Engineering) Responsibility	Level 2 Contact Person (Level 3 Contact Person)
EM Calorimeter Detector **➤Front-End Electronics**	Minnesota	Yuichi Kubota
➤QIE ICs & (integrated) flash ADCs	Fermilab (PPD/ESG)	
➤Front-End Boards & readout to DCBs	Fermilab (PPD/ESG)	
➤Support Electronics		
➤High & low-volt. pwr spys; ctrl & monitoring		
➤Detector temp. control & monitoring		
➤Laser system monitoring		
➤LED pulsers		
➤Nitrogen & helium monitoring		
➤Non-integrating radiation monitoring		
➤Cooling (incl. elec. protection) & ES&H		
➤Etc.		

Project	Primary (Engineering) Responsibility	Level 2 Contact Person (Level 3 Contact Person)
Muon Detector	Vanderbilt	Paul Sheldon
➢**Front-End Electronics**		
➢ASD ICs	Vanderbilt	(Will Johns)
➢Front-End Boards & readout	Vanderbilt	(Will Johns)
➢**Support Electronics**		
➢High & low-volt. power supplies, & their control & monitoring		
➢Cooling (incl. elec. protection) & ES&H		
➢Gas system controls & monitoring		
➢Etc.		

Forward Tracker Microstrip Detector Electronics Project Assignments

Project	Primary (Engineering) Responsibility	Level 2 Contact Person (Level 3 Contact Person)
Forward Tracker Microstrip Detector	Milan	Luigi Moroni
➤**Front-End Electronics**		
➤Silicon ICs	Milan	(Mauro Citterio)
➤Front-End Boards & readout to DCBs	Milan	
➤**Support Electronics**		
➤High & low-volt. power supplies, & their control & monitoring		
➤Additional monitoring for:		
➤Microstrip cooling system - pressure, flow rate (in & out), temp. & humidity (if gas)		
➤Detector & front-end electronics temperature & probably humidity		
➤Nitrogen gas - pressure, flow rate (in & out), temperature & humidity		
➤Etc.		
➤Cooling (incl. elec. protection) & ES&H		
➤Etc.		

Project	Primary (Engineering) Responsibility	Level 2 Contact Person (Level 3 Contact Person)

Forward Tracker Straw Detector
➤**Front-End Electronics**
   ➤ASD ICs
   ➤TDC ICs
   ➤Front-End Boards & readout to DCBs
➤**Support Electronics**
   ➤High & low-volt. power supplies & their control & monitoring
   ➤Oxygen sensor on exhaust side of gas flow
   ➤Gas systems controls & monitoring
   ➤PMT gain monitoring
   ➤Cooling (incl. elec. protection) & ES&H
   ➤Etc.
	Fermilab (PPD/ESG)	

Data Acquisition & Trigger Electronics Project Assignments

Project	Primary (Engineering) Responsibility	Level 2 Contact Person (Level 3 Contact Person)
Data Acquisition (support electronics not shown) ➢**Electronics** ➢**Software**	Fermilab (CD/ESE) Fermilab (CD/ODS)	Joel Butler (Mark Bowden) (Margaret Votava)

Triggers (support electronics not shown)
➢**Pixel**
   ➢**Electronics**
   ➢**Software**
➢**Muon**
   ➢**Electronics (Firmware)**
   ➢**Software**
➢**Global** (part of Data Acquisition's Event Manager)
	Fermilab (CD/ESE)
	
	Illinois
	Illinois
		Erik Gottschalk
		(Vince Pavlicek)
		
		Mats Selens
		(Mike Haney)

Control/Monitoring & Timing (incl. fast controls; support electronics not shown) ➢**Electronics** ➢**Software**	Fermilab Fermilab (CD/OLS)	(Margaret Votava)

Requirements & Preliminary Specifications Documents

Definition Of, Reasons For & Issues In
Requirements & Preliminary Specifications Documents

(Electronics) Documents & Definitions

- **Requirements Document**
  - **This is the initial document for a project. It should be written then formally reviewed before a project starts**
    - This document is a list of the needs of the project and how it interfaces to other electronics and system components
    - Needs include schedule, money and personnel

- **Preliminary Specifications Document**
  - **Once the Requirements document has been approved, this document should be written and then formally reviewed before a project starts**
    - This document has similar or identical section headings to that of the Requirements Document
    - This document is normally written after R&D, beam tests, minimal simulations and/or prototyping
    - This document has as many detailed specifications as are practical before the project is completed

- **Final Specifications Document & Other Documentation**

Requirements Documents – Why?

- **IMPORTANT:**
  - A Requirements document forces the system designer to think in detail about a particular project, all its related issues and needs, and how it interacts with other system components <u>before</u> specifications and development work starts
  - A Requirements document allows others to review and agree on a project's needs and how it integrates into the overall system <u>before</u> significant work starts
  - A Requirements document, along with a companion Preliminary Specifications document, thoroughly written and reviewed by peers will save BTeV substantial amounts of money and personnel time through the course of the project

Requirements Documents – Why?
(continued)

- **The proposed format (template) of the Requirements document makes one approach the system at a higher level**

- **Specifications that are written too soon can cause the system designer to "*miss the forest because of the trees*"**

- **Correct requirements effect design and therefore cost and schedule**

- **Initial requirements writing will identify areas that are unknown and need research (the need to research an item is an initial requirement)**
    - **Results from research need to be put into later drafts of a document**

What it *ISN'T* and *IS*

- **A Requirements Document IS NOT a specification**
  - **It can refer to a specification**
  - **It can refer to a standard**
- **A Requirements Document IS a description**
  - **It describes the function to be performed**
  - **It can describe the way it may be done**

Example 1

- **"Power supply ripple shall be less than 30 mV P-P"**
  - This is a **SPECIFICATION**

- **"Power supply ripple shall effect the output data by less that one bit"**
  - This is a **REQUIREMENT**

Reason 1

- **The requirement says how the device must behave. The designer can trade power supply noise rejection for power supply input noise amplitude. The specification of the power supply then follows the design of the device.**

Example 2

- "**The interface to the control and monitoring system shall conform to IEEE488**"
  - This is also a requirement – the system is *required* to conform to a standard

Reason 2

- **It is a normal part of a requirement document to state that the design has to conform to certain interface specifications. These could also be mechanical in nature.**

Electronics Requirements Document – Issues To Be Included

- Control & monitoring
- Readout including accommodating hit occupancies & their fluctuations
- Electrical & magnetic noise – generated by & susceptibility to
- Grounding & shielding
- Data rates
- Interface to the rest of the system
- Constraints
  - Vacuum
  - Radiation
  - Electrical & magnetic noise – generated by & susceptibility to
  - Distances (e.g., sensor to analog IC)
  - Mass
- Packaging, powering & cooling
- Safety – electronics & personnel

- Cabling & cable routing (yours & others)
- Reliability – overall & how much can be bad & still be "OK"
- Training
- Maintenance – in field & at bench
- Installation
- All other functionality issues
- Quantities
- Etc. (there will be others!)
- (Appendix) Budget
- (Appendix) Schedule & personnel

- Each Requirements document uses a subset of this list of issues
- A follow-up Preliminary Specifications usually uses the same set of issues

Requirements Documents – Aids

- **To aid Requirements document authors, there is both:**
  - **A document describing possible issues for an (electronics) Requirements document**
  - **A template/example of a Requirements document (Pixel High Voltage)**

    (A Session 6 presentation will give URLs to both documents & present an example Requirements document)

  - **Both documents make it easier for the writer**
  - **Both documents help the implementers include the right information**
  - **A BTeV-standard template for Requirements documents will help the writer, reader, reviewers and management understand the project's needs**